

(19) 世界知的所有権機関  
国際事務局



(43) 国際公開日  
2003 年 3 月 27 日 (27.03.2003)

PCT

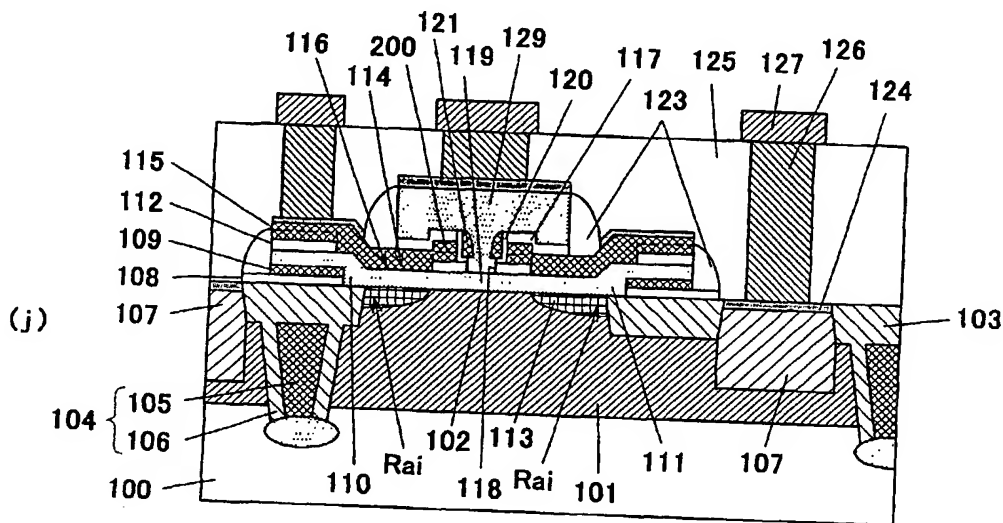
(10) 国際公開番号  
WO 03/026018 A1

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- (21) 国際出願番号: PCT/JP02/09569
- (22) 国際出願日: 2002 年 9 月 18 日 (18.09.2002)
- (25) 国際出願の言語: 日本語
- (26) 国際公開の言語: 日本語
- (30) 優先権データ:  
特願2001-283272 2001 年 9 月 18 日 (18.09.2001) JP
- (71) 出願人 (米国を除く全ての指定国について): 松下電器産業株式会社 (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.) [JP/JP]; 〒571-8501 大阪府 門真市 大字門真 1006 番地 Osaka (JP).
- (72) 発明者; および  
(75) 発明者/出願人 (米国についてのみ): 井戸田 健 (IDOTA, Ken) [JP/JP]; 〒570-0014 大阪府 守口市 藤田町 1-5-10-405 Osaka (JP). 大西 照人 (OHNISHI, Teruhito) [JP/JP]; 〒573-0049 大阪府 枚方市 山之上北町 60-1-1202 Osaka (JP). 浅井 明 (ASAI, Akira) [JP/JP]; 〒543-0001 大阪府 大阪市 天王寺区 上本町 9-5-12-1303 Osaka (JP).
- (74) 代理人: 角田 嘉宏, 外 (SUMIDA, Yoshihiro et al.); 〒650-0031 兵庫県 神戸市中央区 東町 123 番地の 1 貿易ビル 3 階 有古特許事務所 Hyogo (JP).
- (81) 指定国 (国内): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ,

[続葉有]

(54) Title: SEMICONDUCTOR DEVICE AND PRODUCTION METHOD THEREFOR

(54) 発明の名称: 半導体装置及びその製造方法



(57) Abstract: A method of producing a semiconductor device comprising the steps of forming a first-conduction-type collector layer (102) on a part of the surface of a semiconductor substrate, then forming a collector opening (110) in a first insulation layer (108) type layer constituting a base layer on the semiconductor substrate by epitaxial growing a semiconductor layer (111) including a second-conduction-type semiconductor substrate an etching stopper layer (112) for dry etching and a masking layer (200) for wet etching by epitaxial growing, removing part of the masking layer by dry etching to expose part of the etching stopper layer, and wet etching the exposed portion of the etching stopper layer using the remaining masking layer as a mask to thereby form a base joining opening (114) in the etching stopper layer and the masking layer.

[続葉有]



TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

- (84) 指定国 (広域): ARIPO 特許 (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), ユーラシア特許 (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), ヨーロッパ特許 (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI 特許 (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

添付公開書類:

- 国際調査報告書
- 請求の範囲の補正の期限前の公開であり、補正 受領の際には再公開される。

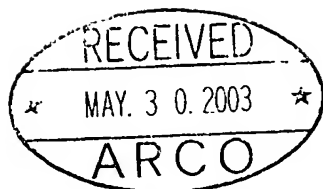
2文字コード及び他の略語については、定期発行される各PCTガゼットの巻頭に掲載されている「コードと略語のガイダンスノート」を参照。

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(57) 要約:

本発明の半導体装置の製造方法は、半導体基板の表面の一部に第1導電型のコレクタ層(102)を形成した後、半導体基板の上に形成した第1の絶縁層(108)にコレクタ開口部(110)を形成し、このコレクタ開口部の半導体基板上にベース層を構成する第2導電型の層を含む半導体層(111)をエピタキシャル成長によって形成し、その後、半導体基板上に、ドライエッチングに対するエッチングストッパ層(112)とウエットエッチングに対するマスキング層(200)とを順次エピタキシャル成長により積層し、ドライエッチングにより、マスキング層の一部を除去してエッチングストッパ層の一部を露出させ、残存するマスキング層をマスクとして該露出したエッチングストッパ層をウエットエッチングすることにより、エッチングストッパ層及びマスキング層にベース接合用開口部(114)を形成するものである。

## PATENT COOPERATION TREATY



PCT

**INFORMATION CONCERNING ELECTED  
OFFICES NOTIFIED OF THEIR ELECTION**

(PCT Rule 61.3)

From the INTERNATIONAL BUREAU

To:

SUMIDA, Yoshihiro  
Arco Patent Office  
3rd Fl., Bo-eki Bldg.  
123-1, Higashi-machi, Chuo-ku  
Kobe-shi, Hyogo 650-0031  
Japan

Date of mailing (day/month/year) 12 May 2003 (12.05.03)		
Applicant's or agent's file reference 02P350WO / HBA		<b>IMPORTANT INFORMATION</b>
International application No. PCT/JP02/09569	International filing date (day/month/year) 18 September 2002 (18.09.02)	
Priority date (day/month/year) 18 September 2001 (18.09.01)		
Applicant MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. et al		

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:

EP : AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR  
National : AU, BG, CA, CN, DE, GB, IL, JP, KP, KR, MN, NO, PL, RO, RU, SK

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:

AP : GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW  
EA : AM, AZ, BY, KG, KZ, MD, RU, TJ, TM  
OA : BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG  
National : AE, AG, AL, AM, AT, AZ, BA, BB, BR, BY, BZ, CH, CO, CR, CU, CZ, DK, DM, DZ, EC, EE, ES, FI, GD, GE, GH, GM, HR, HU, ID, IN, IS, KE, KG, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MW, MX, MZ, NZ, OM, PH, PT, SD, SE, SG, SI, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW

3. The applicant is reminded that he must enter the "national phase" before the expiration of 30 months from the priority date before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing, if prescribed, a translation of the international application (Article 39(1)(a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 36(3)(b) and Rule 74.1).

Some offices have fixed time limits expiring later than the above-mentioned time limit. For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

The entry into the European regional phase is postponed until 31 months from the priority date for all States designated for the purposes of obtaining a European patent.

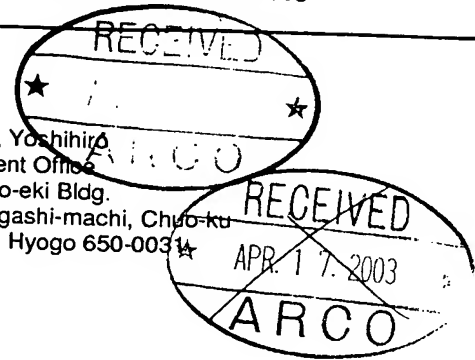
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No. (41-22) 338.70.10	Authorized officer:  Yuichiro AIDA (Fax 338 7010)  Telephone No. (41-22) 338 8994
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From the INTERNATIONAL BUREAU

**PCT**NOTICE INFORMING THE APPLICANT OF THE  
COMMUNICATION OF THE INTERNATIONAL  
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:



SUMIDA, Yoshihiro  
Arco Patent Office  
3rd Fl., Bo-eki Bldg.  
123-1, Higashi-machi, Chuo-ku  
Kobe-shi, Hyogo 650-0031  
JAPON

Date of mailing(day/month/year) 27 March 2003 (27.03.03)		
Applicant's or agent's file reference 02P350WO		
<b>IMPORTANT NOTICE</b>		
International application No. PCT/JP02/09569	International filing date(day/month/year) 18 September 2002 (18.09.02)	Priority date(day/month/year) 18 September 2001 (18.09.01)
Applicant MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.		

1. Notice is hereby given that the International Bureau has **communicated**, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this notice:

KP, KR, US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AE, AG, AL, AM, AP, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EA, EC, EE, EP, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OA, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this notice is a copy of the international application as published by the International Bureau on 27 March 2003 (27.03.03) under No. 03/026018

4. **TIME LIMITS for filing a demand for international preliminary examination and for entry into the national phase**

The applicable time limit for entering the national phase will, **subject to what is said in the following paragraph**, be **30 MONTHS** from the priority date, not only in respect of any elected Office if a demand for international preliminary examination is filed before the expiration of **19 months** from the priority date, but also in respect of any designated Office, in the absence of filing of such demand, where Article 22(1) as modified with effect from 1 April 2002 applies in respect of that designated Office. For further details, see *PCT Gazette* No. 44/2001 of 1 November 2001, pages 19926, 19932 and 19934, as well as the *PCT Newsletter*, October and November 2001 and February 2002 issues.

In practice, **time limits other than the 30-month time limit** will continue to apply, for various periods of time, in respect of certain designated or elected Offices. For **regular updates on the applicable time limits** (20, 21, 30 or 31 months, or other time limit), Office by Office, refer to the *PCT Gazette*, the *PCT Newsletter* and the *PCT Applicant's Guide*, Volume II, National Chapters, all available from WIPO's Internet site, at <http://www.wipo.int/pct/en/index.html>.

For filing a **demand for international preliminary examination**, see the *PCT Applicant's Guide*, Volume I/A, Chapter IX. Only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination (at present, all PCT Contracting States are bound by Chapter II).

It is the applicant's **sole responsibility** to monitor all these time limits.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  Judith Zahra
Facsimile No.(41-22) 740.14.35	Telephone No.(41-22) 338.91.11

## PATENT COOPERATION TREATY

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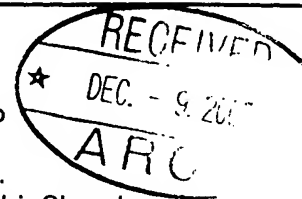
NOTIFICATION OF RECEIPT OF  
RECORD COPY

(PCT Rule 24.2(a))

From the INTERNATIONAL BUREAU

To:

SUMIDA, Yoshihiro  
Arco Patent Office  
3rd Fl., Bo-eki Bldg.  
123-1, Higashi-machi, Chuo-ku  
Kobe-shi, Hyogo 650-0031  
Japan



Date of mailing (day/month/year) 04 November 2002 (04.11.02)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 02P350WO	International application No. PCT/JP02/09569

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. (for all designated States except US)  
IDOTA, Ken et al (for US)

International filing date : 18 September 2002 (18.09.02)  
Priority date(s) claimed : 18 September 2001 (18.09.01)  
Date of receipt of the record copy  
by the International Bureau : 11 October 2002 (11.10.02)  
List of designated Offices :

AP : GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW

EA : AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

EP : AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR

OA : BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG

National : AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ,  
EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU,  
LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR,  
TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW

## ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

- ☒ time limits for entry into the national phase - see updated important information (as of April 2002)  
☐ confirmation of precautionary designations (if applicable)  
☐ requirements regarding priority documents (if applicable)

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No. (41-22) 740.14.35	Authorized officer:  Jutaporn SUNDER (Fax 338 7010)  Telephone No. (41-22) 338.83.38
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**INFORMATION ON TIME LIMITS FOR ENTERING THE NATIONAL PHASE**

The applicant is reminded that the "national phase" must be entered before each of the designated Offices indicated on the cover sheet of this Notification by paying national fees and furnishing translations, as prescribed by Articles 22 and 39 and the applicable national laws. In addition, the applicant may also have to comply with other special requirements applicable in certain Offices. It is the applicant's responsibility to ensure the necessary steps to enter the national phase are taken in a timely fashion. Most Offices do not issue reminders to applicants in connection with the entry into the national phase.

The applicable time limit for entering the national phase will, subject to what is said in the following paragraph, be **30 MONTHS** from the priority date, not only in respect of any elected Office where a demand for international preliminary examination is filed before the expiration of 19 months from the priority date (see Article 39(1)), but also in respect of any designated Office, in the absence of filing of such demand, where Article 22(1) as modified with effect from 1 April 2002 applies in respect of that designated Office. For further details, see PCT Gazette No. 44/2001 of 1 November 2001, pages 19926, 19932 and 19934, as well as the PCT Newsletter, October and November 2001 and February 2002 issues.

In practice, time limits other than the 30-month time limit will continue to apply, for various periods of time, in respect of certain designated or elected Offices. For regular updates on the applicable time limits (20, 21, 30 or 31 months, or other time limit), Office by Office, refer to the PCT Gazette ("Section IV" part published on a weekly basis), to the PCT Newsletter (on a monthly basis) and to the relevant National Chapters in Volume II of the PCT Applicant's Guide (the paper version of which is updated usually twice a year and the Internet version of which is updated usually on a weekly basis). Finally, a cumulative table of all applicable time limits for entering the national phase is available from WIPO's Internet site, via links from various pages the site including those of the Gazette, Newsletter and Guide, at <http://www.wipo.int/pct/en/index.html>.

Information about the requirements for filing a demand for international preliminary examination is set out in the PCT Applicant's Guide, Volume I/A, Chapter IX. Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination (at present, all PCT Contracting States are bound by Chapter II).

**CONFIRMATION OF PRECAUTIONARY DESIGNATIONS**

This notification lists only specific designations made under Rule 4.9(a) in the request. It is important to check that these designations are correct. Errors in designations can be corrected where precautionary designations have been made under Rule 4.9(b). The applicant is hereby reminded that any precautionary designations may be confirmed according to Rule 4.9(c) before the expiration of 15 months from the priority date (this time limit may not be extended). If it is not confirmed, it will automatically be regarded as withdrawn by the applicant. There will be no reminder and no invitation. Confirmation of a designation consists of the filing of a notice specifying the designated State concerned (with indication of the kind of protection or treatment desired) and the payment of the designation and confirmation fees. The Notice of confirmation and payment must reach the receiving Office within the 15-month time limit.

**REQUIREMENTS REGARDING PRIORITY DOCUMENTS**

For applicants who have not yet complied with the requirements regarding priority documents, the following is recalled.

Where the priority of an earlier national, regional or international application is claimed, the applicant must submit a copy of the said earlier application, certified by the authority with which it was filed ("the priority document") to the receiving Office (which will transmit it to the International Bureau) or directly to the International Bureau, before the expiration of 16 months from the priority date, provided that any such priority document may still be submitted to the International Bureau before that date of international publication of the international application, in which case that document will be considered to have been received by the International Bureau on the last day of the 16-month time limit (Rule 17.1(a)).

Where the priority document is issued by the receiving Office, the applicant may, instead of submitting the priority document, request the receiving Office to prepare and transmit the priority document to the International Bureau. Such request must be made before the expiration of the 16-month time limit and may be subjected by the receiving Office to the payment of a fee (Rule 17.1(b)).

If the priority document concerned is not submitted to the International Bureau or if the request to the receiving Office to prepare and transmit the priority document has not been made (and the corresponding fee, if any, paid) within the applicable time limit indicated under the preceding paragraphs, any designated State may disregard the priority claim, provided that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within the time limit which is reasonable under the circumstances.

Where several priorities are claimed, the priority date to be considered for the purposes of computing the 16-month time limit is the filing date of the earliest application whose priority is claimed.

## PATENT COOPERATION TREATY

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From the INTERNATIONAL BUREAU

**NOTIFICATION CONCERNING  
SUBMISSION OR TRANSMITTAL  
OF PRIORITY DOCUMENT**

(PCT Administrative Instructions, Section 411)


To:

SUMIDA, Yoshihiro  
Arco Patent Office  
3rd Fl., Bo-eki Bldg.  
123-1, Higashi-machi, Chuo-ku  
Kobe-shi, Hyogo 650-0031  
Japan

Date of mailing (day/month/year) 04 November 2002 (04.11.02)	<b>IMPORTANT NOTIFICATION</b>
Applicant's or agent's file reference 02P350WO	
International application No. PCT/JP02/09569	International filing date (day/month/year) 18 September 2002 (18.09.02)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 18 September 2001 (18.09.01)
Applicant MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. et al	

- The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
- This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
- An asterisk(\*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
- The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
18 Sept 2001 (18.09.01)	2001-283272	JP	11 Octo 2002 (11.10.02)

<p align="center"><b>The International Bureau of WIPO</b> 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No. (41-22) 740.14.35</p>	<p>Authorized officer</p> <p align="right">Jutaporn SUNDER (Fax 338 7010)</p> <p>Telephone No. (41-22) 338.83.38 </p>
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